LABORATORY INVESTIGATION OF THE TIMESCALES OF ELECTROSTATIC DUST TRANSPORT PROCESSES ON THE SURFACES OF AIRLESS BODIES. X. Wang[1,2], N. Hood[1,2], A. Carroll[1,2], R. Mike[1,2], H. –W. Hsu[1,2] and M. Horányi[1,2] ; [1]Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder, Colorado 80303, USA; [2]NASA/SSERVI's Institute for Modeling Plasma, Atmospheres and Cosmic Dust, Boulder, Colorado 80303, USA. (First author's address: 3665 Discovery Drive, Boulder, CO 80303; Email: xu.wang@colorado.edu)

Recent laboratory experiments, along with the newly developed "patched charge model", have shown strong evidence in support of the occurrence of electrostatic dust transport on the surfaces of airless bodies due to exposure to solar wind plasma and solar ultraviolet (UV) radiation. These new studies provided more insight into the role of electrostatic dust transport process in the surface evolution of these bodies and several puzzling planetary observations.

Here we report on new laboratory experiments that estimate the timescales of this process in shaping the regolith of airless bodies. Dust lofting rates are recorded over long exposure to energetic electrons that create secondary electrons to best simulate the energy distribution and flux of photoelectrons emitted from the surfaces of airless bodies at 1 AU. It is found that dust lofting is not a constant process; rather it slows down as time progresses. This is likely due to the formation of fewer microcavities and stronger cohesive force as the porosity decreases with an increase in the depth due to gravity.

Our laboratory experiments estimate that the transient dust lofting rate at 1 AU could be as high as a few tens of particles cm^{-2} s^{-1}. This rate is sufficient for supplying the 'lunar horizon glow' process. For large bodies such as the Moon, due to their large gravity, the continuously decreasing lofting rate indicates that the geological timescale of electrostatic dust transport is expected to be very long. On the other hand, dust lofting on smaller bodies such as asteroids is expected to be relatively fast with more constant rates due to reduced gravity. This may cause the loss of regolith on small bodies with low escape speeds.